MEGACITIES AND THE UNITED STATES ARMY
PREPARING FOR A COMPLEX AND UNCERTAIN FUTURE

Chief of Staff of the Army, Strategic Studies Group

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Our Army is in a period of transition after over a decade at war. I have provided my vision of what the Army must be during and after this transition: "The All-Volunteer Army will remain the most highly trained and professional land force in the world. It is uniquely organized with the capability and capacity to provide expeditionary, decisive landpower to the Joint Force and ready to perform across the range of military operations to Prevent, Shape, and Win in support of Combatant Commanders to defend the Nation and its interests at home and abroad, both today and against emerging threats."

This vision can only be realized by an Army that is actively preparing for the future, which some have said is unknowable. How then do we prepare the Army for the complex problems of the "unknown" in which it will play a key role in solving for our Nation?

Not knowing the details of the future is no excuse for not studying the problems and opportunities any future may hold. Our Army is focused on becoming globally responsive and regionally engaged. The Regionally Aligned Forces initiative is giving us greater understanding of the places where the Army may be called upon to operate in the future. It is also providing opportunities to create regional understanding and establish relationships with partners in these regions. As we look to regions of interest, one key attribute of most of them is that increasing urbanization throughout the world is making the megacity one of the key features of many potential operational theaters. Future Army missions, as they have in the past, will be centered around actions to influence people. And most of the world's population will be in urban areas. This is a problem that we must begin to understand and for which we must prepare.

Our Army has experience throughout its history of operating in urban environments, from Aachen to Seoul to Baghdad. We have not, however, operated in urban areas with populations of over 10 million people—the megacity. This paper, written by my Strategic Studies Group, begins a discussion of the complexities, challenges, and opportunities the megacity will present to our Army.

It is a read well worth your time.

General Raymond T. Odierno
38th Chief of Staff
United States Army

Executive Summary

"Crowded megacities, beset by poor living conditions, periodic rises in the price of commodities, water shortages, and unresponsive municipal services, will be fertile petri dishes for the spread of both democracy and radicalism, even as regimes will be increasingly empowered by missiles and modern, outwardly focused militaries."

- Robert Kaplan, *The Revenge of Geography: What the Map tells Us about Coming Conflicts and the Battle against Fate*

Cities with populations of ten million or more are given a special designation: megacity. There are currently over twenty megacities in the world, and by 2025 there will be close to forty.[1] The trends are clear. Megacities are growing, they are becoming more connected, and the ability of host nation governments to effectively deal with their explosive growth and maintain security is, in many cases, diminishing. Megacities are a unique environment that the U.S. Army does not fully understand.

Megacities are growing so fast that it is becoming increasingly difficult for host nation governments to keep up with infrastructure and resource requirements. Drivers of instability are already present and in many places are growing by the day. It is inevitable that at some point the United States Army will be asked to operate in a megacity and currently the Army is ill-prepared to do so.

The scale and connectedness of megacities lend gravity to events within them, which can quickly capture international attention and compel military commitment. Accurate predictions of where unrest will occur will likely continue to elude analysts in the future as it has in the past. Monitoring megacities, however, may provide decision makers with effective predictors of looming instability with global impact. The problems found in megacities (explosive growth rates, vast and growing income disparity and a security environment that is increasingly attractive to the politically dispossessed) are landpower problems. Solutions, therefore, will require boots on the ground.

By increasing its appreciation of megacities, the U.S. Army can better understand how it might operate within them as part of a joint, interagency, intergovernmental, and multinational (JIIM) team. Leaders

The urban sprawl of the developing megacity in Lagos, Nigeria. [b]

who appreciate the complexity of these environments will provide options to the National Command Authority that more closely match the objectives set forth in current and future National Security Strategies.

The process of building understanding of each unique megacity will be neither quick nor easy. Only through a methodical, relentless approach to appreciating complexity will the Army of the future be able to meet the demands put upon it.

This document is a first effort to explore the megacity challenge. The strategic significance of these places is explored, as well as the gap in both the Army's and, more broadly, the Joint Community's understanding of them. An approach for strategically appreciating megacities is offered, and case study vignettes from cities across the globe illustrate unique challenges posed by megacities. Finally, a series of first-order questions about the way forward are posed to provoke thought about how the Army might lead the effort to address the challenges posed by megacities.

Strategic Significance

"Failing to prepare for military operations in dangerous megacities could leave a future president without the means to do something that he or she considers to be in the national interest."

- Steven Metz, *Strategic Horizons: How the U.S. Military Might Get Involved in a Megacity*

Megacities are rapidly becoming the epicenters of human activity on the planet and, as such, they will generate most of the friction which compels future military intervention. Yet, even as megacities receive more study amongst military practitioners, the question of relevance still often arises: "Why would the U.S. Army go to one of these places?" Underlying that question is an understanding that current Army doctrine and historic military judgment advocates avoiding urban areas in general for reasons of practicality and risk. Fundamentally, questions of relevance and current doctrine regarding megacities all assume the U.S. military will have complete control over the location and circumstance of its next engagement. Examining previous surprises, like the Japanese attacks on Pearl Harbor or Al Qaeda on New York City, should disabuse military planners of these notions. Both events were not predicted by decision makers of the time and led to unanticipated military commitments. Flawed assumptions aside, it is important to view the megacity through the lens of national interest. Understanding how these environments may become magnets for international attention and demand military intervention will aid military planners in avoiding future strategic surprises. This is an important distinction; it is less of a question of why the U.S. Army would go than a question of what conditions would draw the Army into a megacity.

World-wide, an historic transition is underway. Over half of all people currently live in cities, and the rate of migration is accelerating. By 2030, cities will account for 60% of the world's population and 70% of the worlds GDP. [2] Each day, an estimated 180,000 people across the globe migrate to cities. [3] In the next century, the urban environment will be the locus where drivers of instability will converge. By the year 2030, 60% of urban dwellers will be under the age of

18. [4] The cities that grow the fastest will be the most challenged. Urban areas are expected to grow by 1.4 billion in the next two decades, with that growth occurring almost entirely in developing world. [5] As resources become constrained, illicit networks could potentially fill the gap left by over-extended and under-capitalized governments. The risk of natural disasters compounded by geography, climate change, unregulated growth and substandard infrastructure will magnify the challenges of humanitarian relief. As inequality between rich and poor increases, historically antagonistic religions and ethnicities will be brought into close proximity in cities. Stagnation will coexist with unprecedented development, as slums and shanty towns rapidly expand alongside modern high-rises. This is the urban future.

To ignore megacities is to ignore the future. The growing significance of these places will naturally make their stability critical for U.S. policy objectives and global equilibrium. Failure to focus attention on
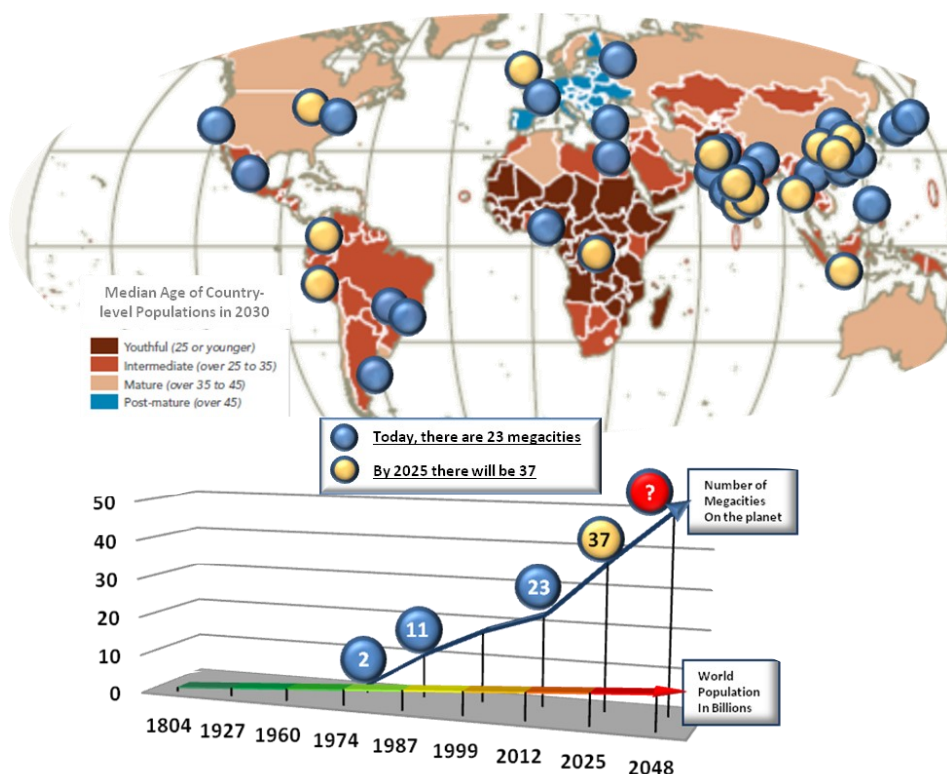

Dhaka, Bangladesh. Crowded South Asian megacity with population roughly equivalent to that of Afghanistan. [c]

these places today will create strategic vulnerability for the U.S. tomorrow.

Megacities will continue to occupy key strategic terrain, making their stability necessary for global connectedness and order. Megacities like Cairo, Egypt and Karachi, Pakistan occupy unique positions in relative proximity to the global commons. These urban epicenters will evolve into a connected network of economic hubs which will drive the global economy. Tokyo, Japan and Shanghai, China will be among the top five cities with the highest GDP in the world by 2025.[6] Some megacities will be conduits for access to critical natural resources, like petroleum. Nigeria, for example is the largest oil producing country in Africa, and the fourth leading exporter of liquefied natural gas in the world.[7] Lagos is the deep water port and essential hub through which most of Nigeria's oil exports flow.

The growing global population is becoming increasingly urbanized. [d, e]

Megacities may also offer safe haven for threat groups who wish to strike the U.S. home land while simultaneously megacities' links to national interest only grow stronger over time. This dichotomy of threat conjoined with growing criticality will produce a complex security environment which will challenge policy makers and military planners. These places offer several benefits to discrete threat networks. Large migratory populations reduce the transnational signature normally associated with terrorists, criminal, and espionage activities. Operating from megacities allow hostile actors relative freedom of maneuver as they blend in with the local population.

It is highly likely that megacities will be the strategic key terrain in any future crisis that requires U.S. military intervention. Population, urbanization, and resource trends contributing to the rise of megacities show no signs of abating or reversing. The increasing importance of the megacity does not translate into resilience or a lack of fragility. In fact, in most megacities, fragility and a lack of capacity are the norm. The growing significance of these places coupled with their fragility and lack of resilience creates a proposition fraught with strategic risk. It is clear that megacities

are becoming more important while at the same time presenting increased security risks. Ignoring these cities can create strategic vulnerability if there exists within them a stressor which exceeds the city's ability to cope. Such conditions would likely call for some form of outside intervention. If the demand signal or threat poses enough risk to U.S. national interest, military intervention is a likely scenario - in which case failure to understand these places will produce operational and tactical vulnerability as well.

The Chief of Staff of the Army directed his Strategic Studies Group to undertake a one-year research project to add greater depth to the Army's understanding of the implications of megacities to the future. A multi-faceted approach was used to understand past urban operations, current thinking on the subject, and what the Army can do today to prepare itself for the enormous challenges it may face in megacities in the future.

Methodology

The Chief of Staff of the Army's Strategic Studies Group (SSG) is comprised of a diverse set of military and civilian fellows who come together for one year to explore and develop strategic concepts for the United States Army. The 2013-2014 SSG sought to imagine a profoundly different Army, able to deal with the complexity of future operating environments. It self-selected into five Concept Teams, one of which focused exclusively on the unique opportunities and challenges associated with megacities in the deep future.

The Megacities Concept Team reviewed historical examples of urban operations and Army and Joint doctrinal publications relevant to urban conflict. It also carried out an extensive literature review on past military interventions in urban settings and current thinking on the implications of the global trends that are driving urbanization. The team engaged with senior leaders across the Department of Defense, the U.S. Government, industry and academia. Because appreciation of megacity environments is difficult to achieve solely through academic research, the team also conducted a series of case studies that included field work in Dhaka, Bangladesh; Lagos, Nigeria; New York City; Bangkok, Thailand; and Mexico City, Mexico. A virtual case study was completed on Rio de Janeiro and Sao Paulo, Brazil.

The results of the team's research were briefed to the Chief of Staff of the Army, and to a group of trusted agents. This publication is a summary of that work, and fuller treatments of each of the subjects discussed here is available by request from the Office of the Chief of Staff of the Army and the Strategic Studies Group.
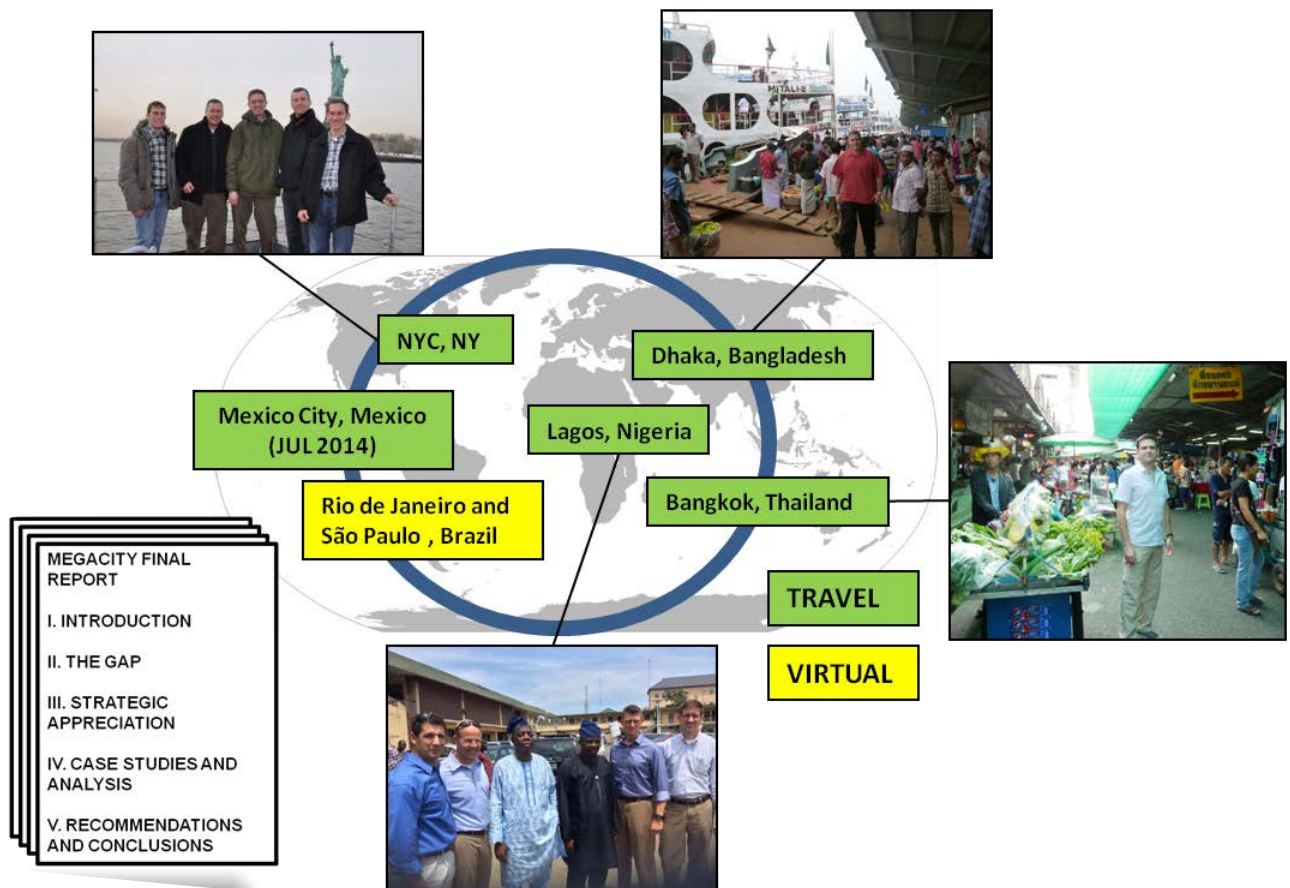
The SSG Megacities Concept Team employed a combination of theoretical research and practical fieldwork to produce their report.

Field work in international megacities was essential to understanding the military implication of these emerging environments. Lagos, Nigeria. [f]

Megacities are not only an international phenomenon. The Iconic skyline of New York City is universally recognizable. [g]

The Gap

Urban fighting is not, in itself, a new challenge for the Army. From the streets of Aachen to the markets of Baghdad, Soldiers have defeated enemies who attempted to use urban terrain to their advantage. Urban conflict is ingrained deeply in the Army's history.

The approaches derived from this history are, however, insufficient to address the challenges posed by megacities. The Army's largest and most recent example of urban operations is small in comparison to the challenges ahead. In Baghdad, the Army fought for almost a decade in an urban environment with a population of 6.5 million people.[8] By 2030, there will be 37 cities across the world that are 200-400% larger than Baghdad.[9]

A gap exists in the Army's doctrinal understanding of large cities. Moreover, megacities are not treated as units of analysis for study and intelligence collection or featured in planning scenarios. The Army, and the DoD community more broadly, neither understands or prepares for these environments.

DOCTRINE: Current Army doctrine on urban operations, as outlined in FM 3-06, *Urban Operations*, visualizes cities as elements of larger areas of operation. It provides considerations for commanders as they apply the fundamental tenets of maneuver in a different terrain. While cautioning against the employment of linear, systematic ground operations that allow an urban adversary to attrit friendly forces, the traditional forms of offensive maneuver are nevertheless presented.[10] The critical task associated with shaping the environment is isolating the city by

Army Urban Doctrine assumes the ability to isolate and shape Cities in order to Set Conditions for Operations. [h]

Urban Doctrine, exemplified by the Small City surrounded by Maneuver Graphics, is insufficient for Megacities. [i]

exerting control around its perimeter, as well as decisive points within it. The conduct of offensive operations within the urban environment proceed from the periphery inwards, enveloping or turning the adversary if possible and penetrating or infiltrating the city if necessary.[11]
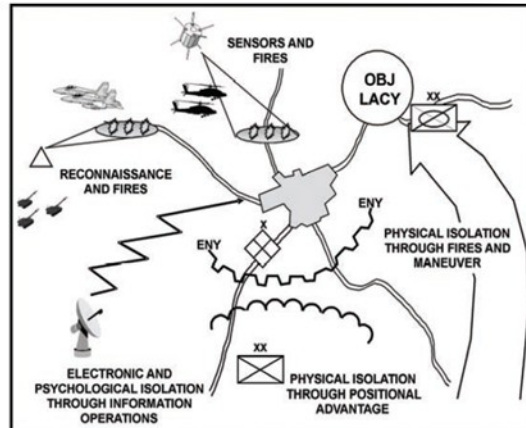
The fundamental assumptions implicit to these approaches are the ability to isolate and shape the urban environment and to utilize ground approaches from the periphery into the city. For megacities, both of the assumptions are flawed. By virtue of their scale, megacities cannot be physically or virtually isolated. Physically controlling a urban population consisting of tens of millions of people spread over hundreds of square miles with military forces numbering in the tens of thousands not only ignores the force ratios recommended in doctrine but actually inverts them. Virtual isolation is even more improbable given cell phone saturation in urban environments worldwide and global in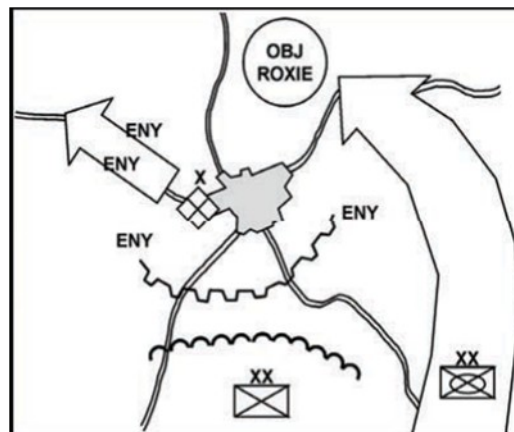terconnectedness through the World Wide Web. Ground maneuver from the periphery is also unrealistic. The congestion of ground avenues of approach, combined with the massive size of the megacity environments, makes even getting to an objective from the periphery questionable, let alone achieving an operational effect.

The scale of megacities, in essence, defies the military's ability to apply historical methods. The Army's doctrinal and operational approaches to urban environments seek to shape them in order to yield conditions that allow the use of traditional techniques. This will not work in a megacity. It is a funda-

mentally new operating environment to which the Army must shape itself and discover new approaches.

CITY AS A UNIT OF ANALYSIS:
Megacities are emerging environments that potentially pose significant military risks. They require concerted and continuous intelligence, academic, and operational focus. This emphasis does not currently exist within the Army or the Department of Defense (DoD).

Analytical portfolios in the DoD Intelligence Community are not focused on cities. Efforts focus on countries, regions, adversaries and a variety of trends of concern to decision makers. While efforts are underway to develop collection capabilities focused on remotely characterizing cities, there does not exist (as of the writing of this paper) any analytical arm dedicated to understanding cities to support the war fighter. [12]

Military Studies Programs both within the institutional Army and at civilian institutions currently provide long term academic focus for various topics of military interest. While a large body of knowledge exists on how urbanization and megacities impact politics, economics and the environment, there is no academic effort focused on researching the military implications of these environments.

Regional alignment efforts are underway to strengthen or establish habitual relationships between combatant commands, allocated units, and partner nations. These engagements are done at the behest of the Geographic Combatant Commanders as part of their security cooperation initiatives to support en-gagement and pre crisis activities. These efforts are not furthering institutional understanding or operational proficiency in the megacities found in their respective regions.

STRATEGIC ANALYSIS PRODUCTS:
Support to Strategic Analysis products, such as Defense Planning Scenarios, DoD/Joint Staff Planning Scenarios and approved force sizing scenarios are all designed to allow the Joint Force to consider future contingencies and test capabilities against them. Though cities are featured in many of the current planning tools, they all fail to incorporate complex urban terrain within the context of a megacity. Cities, depicted with defined perimeters, are all modeled as division or brigade-level objectives that can be isolated, shaped and operated on from the periphery. No scenario challenges current doctrinal approaches or even incorporates the challenges faced by the Army in Baghdad over the last decade. [13]

Taken together, the insufficiency of doctrine, lack of emphasis on cities as units of analysis and absence of large cities in force planning scenarios combine to yield both a lack of understanding of the challenges posed by these environments and a lack of preparedness to operate within them.

The framework for strategically appreciating large urban environments, as presented in the next section, begins the process of examining megacities as units of analysis and confronting the challenge they pose to military operations.

Muscatatuck Urban Training Center, DoD's Largest Urban Training Facility, has 68 Buildings and covers 4 square kilometers. [j]

Dhaka, Bangladesh, has an estimated 1.4 million buildings and covers 590 square kilometers. [k]
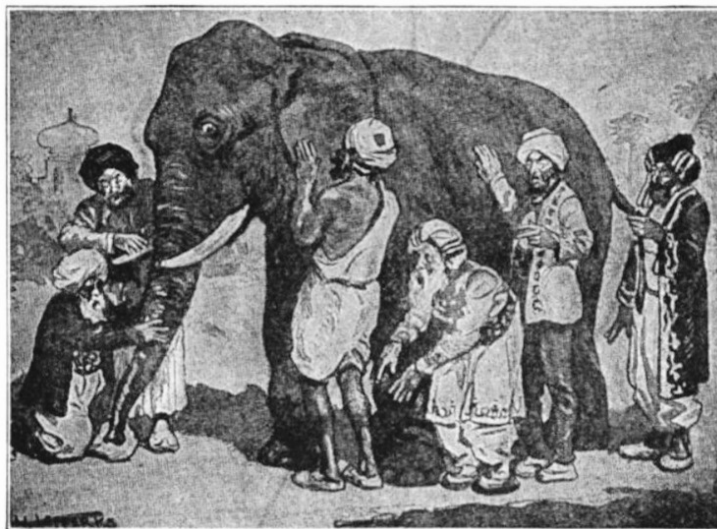
Strategic Appreciation

"Wholes" and "heaps" are not mysterious metaphysical notions but clearly, even mathematically, definable states of complex entities. The decisive difference is that wholes are not the simple sum of their parts, and heaps are.

—Ervin Laszlo, *The Systems View of the World*

When asked how to approach a complex problem, General Creighton Abrams famously quipped that "when eating an elephant take one bite at a time." [14] The cognitive approach behind the "one bite" method of thinking underpins most military doctrine and can be classified as *reductionist* in nature. Reductionist approaches to systems seek to identify, isolate and analyze system components as separate entities. Once critical or dominant "nodes" in the system are analyzed they are then examined with respect to the relationship between each entity, thereby revealing a picture of the system as a whole.

Though reductionist methods can be effective for describing and understanding mechanical systems with linear causal relationships, they fall short when dealing with complex systems. Complex systems act as entities in their own right, independent of the nature of its parts. Army doctrine, while referring to urban terrain as a "complex environment," simultaneously espouses the use of a reductionist approach to gain understanding. [15]

The scale of megacities, the multiplicity of relationships at play within them, and their global connectedness defy efforts to map or fully understand them. Application of reductionist approaches espoused in current doctrine both fail to account for all the variables at play and the behavior of the city as a whole. Different approaches to modeling cities must be considered.

The nature of each megacity's complexity makes it unique. No two cities exhibit the same emergent properties, or are connected (internally or externally) in the same way. This means that every endeavor in an urban environment requires a novel approach and a unique understanding: no template or checklist of reconnaissance targets will reveal the nature of the city. Instead, commanders wishing to achieve strategic ends in a megacity must appreciate each city as a unique whole, with a unique context and nature and must operate in concert with this nature.

As a tool for guiding strategic appreciation, the use of a systems-theory based typology helps focus commanders and planners on the city as a whole. This approach reveals options for commanders that are remarkably different than those determined through reductionist means, and are more likely to lead to positive strategic outcomes.

Thus, simply understanding the behavior of individual parts of a complex system is insufficient. One must develop an appreciation for the whole of the system to comprehend the behavior of its subcomponents. Here we propose a method to achieve strategic appreciation that involves consideration of **characteristics** including context, scale, density, connectedness, flow and a threat profile. The unique city-specific interplay between these characteristics, combined with unique combinations of **driv-**

The megacity must be understood as more than the sum of its parts. [I]

ers of instability and capacity reveals a **typology** that can be useful for categorizing megacities and thinking about what the Army might, and might not, have to do if called on to operate within them.

CHARACTERISTICS

Context, scale, density, connectedness and flow are characteristics that, when studied in the context of a megacity, can lead to a greater strategic appreciation of the operational environment. Ultimately, this increased appreciation will allow the Army to operate more effectively in a joint, inter-agency, intergovernmental and multinational (JIIM) environment.

CONTEXT: Every megacity is unique and must be understood within its own historical, cultural, local, regional and international context. Knowledge of the rate and characteristics of a megacities' growth may enrich contextual understanding, as will knowledge about certain drivers of instability. There are major differences between cities that are growing steadily out of consistent, opportunity-based processes and those that are growing explosively out of processes based on dependency and exploitation. It may not be possible to expect the similar levels of host-nation capability in contextually diverse megacities. The Army will be forced to shape itself to the environment, not the other way around.

Characteristics

Density
Flow
Scale
Complexity
Connectedness
Context
Threats

While each megacity is unique and must be understood in its own context, megacities share some fundamental characteristics which contribute to their complexity.

SCALE: The relative size of megacities differentiates them from other urban environments and presents a fundamental challenge to the Army's doctrine and force structure. Density, connectedness, flow and context can be studied in any environment, but understanding these elements at scale is what makes megacities a different problem set. Re-thinking force-sizing constructs might be a requirement in megacity environments. [16]

DENSITY: Population, infrastructure, and signals all pose significant challenges with regard to density.

Population density can, intentionally or unintentionally, disrupt flows on fixed capacity lines of transportation and communication in and around the urban environment. [17] Structural density limits maneuverability and places limitations on a formation's ability to mass, which disaggregates combat power. Electronic signal density presents problems with bandwidth congestion and signal-based targeting.
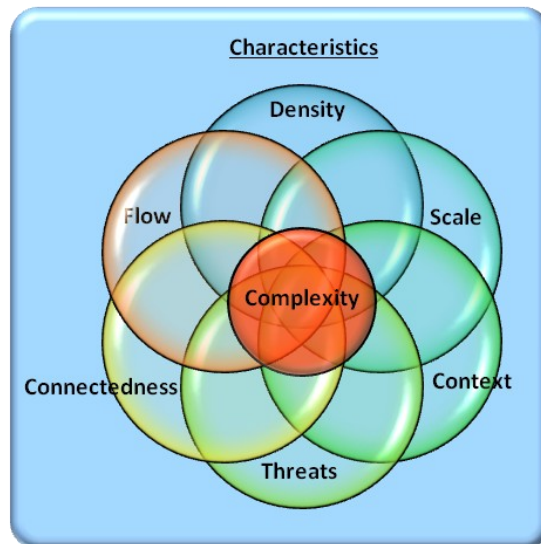
CONNECTEDNESS: It is obvious today that cities don't exist in isolation. Attempting to isolate one, as recommended by current doctrine, will be difficult and likely lead to unforeseen consequences. Instantaneous information transfer, robust international surface and air shipping, and mass migration (legal and illegal) connect the cities around the world in ways undreamed of only a decade ago. Robust and redundant external connectedness makes isolating a modern city nearly impossible. Indeed, recent attempts at shutting down social media in Turkey,[18] Egypt and Libya [19] illustrate how resilient modern communications systems are becoming. This robust connectedness can be used to great advantage see and understand the city's systems, even from remote locations.

FLOW: Flow is the movement of people, resources or things into or out of a megacity. Just as a living organism relies on flows in (food, air and water), and flows out (waste) to stay alive, a city also requires flows. Vast amounts of energy and other vital goods must flow into the megacity, these goods must circulate throughout the urban space, and waste must flow out if the megacity is to remain healthy. Doctrinal approaches in the future must prioritize the preservation of key flows in order to maintain the health of the population. In so doing the Army will reduce the requirement for reconstruction efforts that inevitably follow major urban conflicts.

THREATS: Megacities are constantly challenged by threats to their stability. The nature of these environments manifest multiple dynamics of observable friction which operate against the city or emanate from within it. These manmade and natural threats contribute significantly to the complexity of the megacity.

Dynamics of Instability & Capacity

> *"In both revolutions and earthquakes it is useful to distinguish the structural conditions (pressures, which build up slowly) from triggers (sudden releasing events, which immediately precede a social or geological eruption."*
>
> - Jack Goldstone, *Modeling Social Pressures Toward Political Instability*

Tipping points and triggers are analogies which describe the cumulative effect of various inputs or stressors, on or within a megacity, whose massing precipitates a dramatic shift in a system, or systems, from a state of equilibrium to a state of relative imbalance. There is no set, universal measure for these tipping points: each city has its own equilibrium which must be understood in its own unique context. In some mega cities this equilibrium is a delicate condition (fragility); in others, order, security, and solvency are robustly maintained with heavy investment in redundancy and contingency management (resilience).

Regardless of the fragility or resilience of the city, their stable functioning is dependent on systems of finite capacity. When these systems, formal or informal, real or virtual experience demand which surpasses their capacity, the load on the city's systems erode its support mechanisms, increasing their fragility. These systems are then more vulnerable to triggers which can push the city past its tipping point and render it incapable of meeting the needs of its population. [20]

Some dynamics of friction are observable in all megacities to varying degrees. Population growth and migration, separation and gentrification, environmental vulnerability and resource competition, and hostile actors are all present in some fashion within every megacity.

POPULATION GROWTH AND MIGRATION:
One of the hallmarks of megacities is rapid hetero and homogeneous population growth that outstrips city governance capability. Many emerging megacities are ill-prepared to accommodate the kind of explosive growth they are experiencing. [21]

SEPARATION AND GENTRIFICATION: Radical
income disparity, and racial, ethnic and sub cultural

Megacities are subject to frictions, such as disruptive acts by hostile actors, which can exceed their capacity. [m]

separation are major drivers of instability in megacities. As these divisions become more pronounced they create delicate tensions, which if allowed to fester, may build over time, mobilize segments of the population, and erupt as triggers of instability.

ENVIRONMENTAL VULNERABILITY AND RESOURCE COMPETITION: Unanticipated
weather events and natural disasters can be powerful catalysts which can devastate city systems, interrupting governance and service delivery. While natural cataclysms occur across the globe, and have throughout human history, these events will affect larger populations, densely packed into urban centers in ways and on a scale never before seen. Environmental disasters and resource scarcity (real or perceived) can produce relative resource disparity, competition, and instability which can rapidly exceed the capability of local authorities to address. [22]

HOSTILE ACTORS: If internal or foreign actors
conducted offensive operations which exceeded a

city's capacity to contain or defend against them, external intervention could be required to return the city to its previous state. [23] This would be especially true if the city is in an allied country or the threat is preparing to extend its hostilities to the U.S. homeland or its citizens abroad.

Should any of these frictions arise and become disruptive to the international system they will demand outside intervention to restore some semblance of order. This order may not resemble previous conditions, but some likeness of equilibrium must be present in the "new normal." This ability of the city to reconstitute its systems or adapt to a new normal is a measure of the city's capacity for resilience.

CAPACITY: Every city has a unique way of organizing, equipping and connecting the resources required to maintain its systems. Understanding the systems that keep the city functioning is an essential component of understanding the nature and logic of the city itself. Similarly, understanding the surge capacity of the city (the emergency response capability, the extent of planning and exercising emergency procedures, the material resources and reserve or mobilization capability, etc.) is essential to forecasting the city's ability to return to steady-state and how much external assistance may be necessary to help it do so.

ANTI-FRAGILITY AND RESILIENCE: Cities differ widely on their ability to adapt to volatility and stress. Some cities respond poorly to adversity, making bad situations worse. Others return quickly to a normal state, expending resources to minimizing the impact of the adversity. These characteristics are *fragility* and *resilience* respectively. Many cities learn and grow from adversity, a characteristic that is coming to be known as *antifragility*. [24]

There is a strong correlation between highly integrated systems and antifragility. In large urban environments, a highly-integrated city like New York exhibits antifragile characteristics when it learns from setbacks and then designs systems that prevent future disruptions from similar events. [25] Loosely integrated cities, on the other hand, show little or no improvement in the aftermath of adverse events. Unless a city learns and evolves from adverse events, it is not antifragile and future events can overwhelm it. Even the most resilient cities will eventually wear down under constant and increasing pressure.
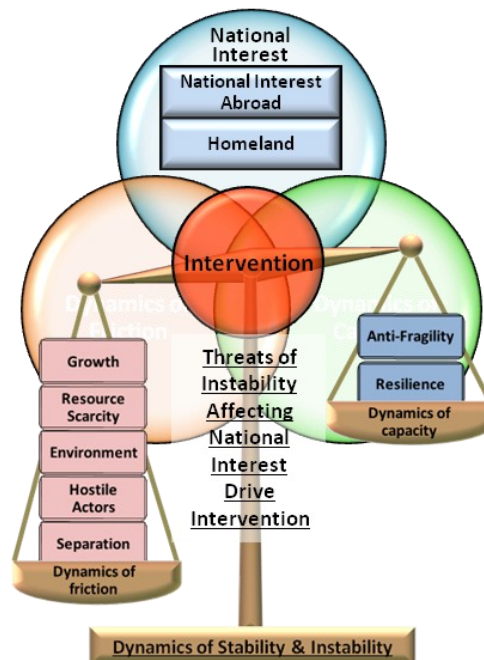
Friction which exceed the capacity of megacities cause an imbalance. Intervention will occur where and when this imbalance coincides with US national interest.

NATIONAL INTEREST: Both the stressors on a city and its capacity to absorb or recover from them must be understood in context. Stressors which exceed the capacity of the city will create a gap or a delta of risk. Military intervention may be required if this delta adversely affects national interest in a way which cannot be managed by other elements of U.S. national power.

This model is a gross oversimplification of an extraordinarily complex dynamic. There are no absolute measures to quantify stress or capacity. Stressors and capacity must be understood in context of the specific city. The same stressor may exist in two different cities, but the scope of the stressor may be completely different, as might the capacity of the city or approach to responding to the stressor. The model is not intended to be all inclusive; rather it is meant to provide a framework for organizing the various dynamics in play which may precipitate military intervention in a megacity. An Army that has ignored the importance of megacities will be unable to offer national leaders strategic options.

COMPARING MEGACITIES: The ability of megacities to withstand and recover from expected or unexpected stressors is largely based on the city's degree of integration. Some megacities are more integrated than others and, when compared to one another, this degree of integration can be used to categorize megacities into a basic typology.

An Emerging Typology of Megacities

A typology of megacities is emerging. It ranges from cities that are highly integrated (e.g. New York City or Tokyo) with hierarchical governance and security systems, to cities that are loosely integrated (e.g. Lagos, Nigeria or Dhaka, Bangladesh) with alternatively governed spaces and security systems. Some cities exhibit a combination of the two .

Highly integrated systems are characterized by strong formal and informal relationships among its component parts. These relationships manifest as highly ordered hierarchical structures with formalized procedures and norms, and open communication among its various parts. Highly integrated systems are inherently stable, show high degrees of resilience (ability to absorb stress) and manage growth in a relatively controlled manner.

to control portions of the city and episodically control other less integrated parts of the city. These conditions are brought about by rapid, unplanned growth, compounded by separation.
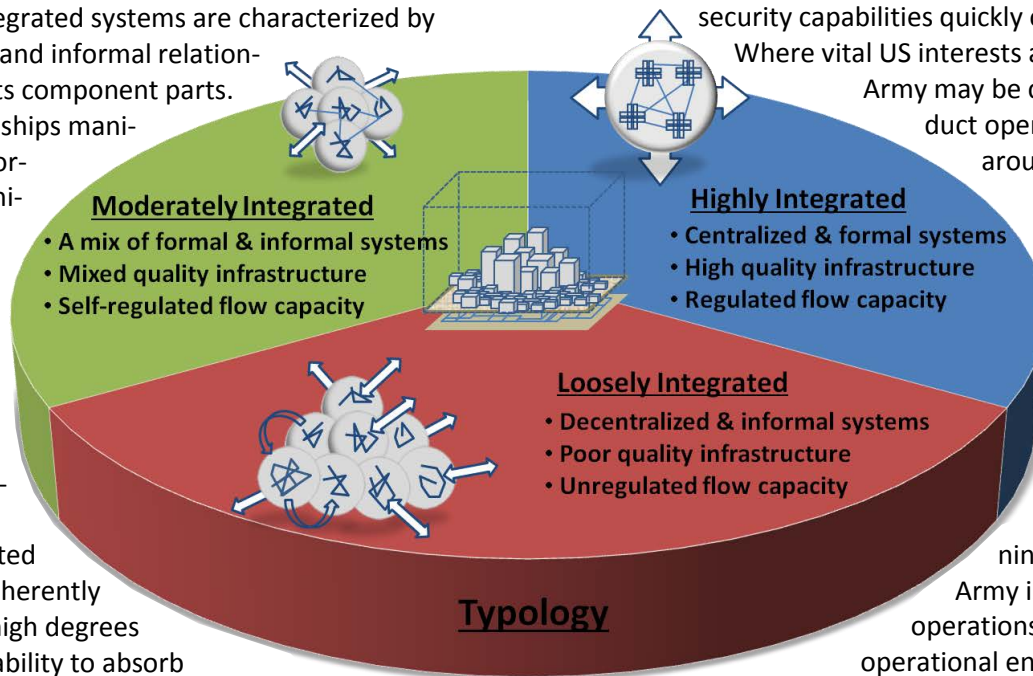
Some megacities, particularly highly integrated cities, are capable of coping relatively well when instability arises, while others will have their service and security capabilities quickly overwhelmed. Where vital US interests are at stake, the Army may be called on to conduct operations in and around megacities to achieve strategic goals that protect those interests. Lacking relevant historical examples on which to base training, education and planning, we believe the Army is not prepared for operations in these unique operational environments. Entirely new concepts are needed to prepare the Army to conduct operations in the megacity environment.

Moderately Integrated
- A mix of formal & informal systems
- Mixed quality infrastructure
- Self-regulated flow capacity

Highly Integrated
- Centralized & formal systems
- High quality infrastructure
- Regulated flow capacity

Loosely Integrated
- Decentralized & informal systems
- Poor quality infrastructure
- Unregulated flow capacity

Typology

Some megacities can be typified based on their degree of integration.

Loosely integrated cities, on the other hand, lack many of the formal relationships that keep highly integrated cities stable. Weak control and communications systems, and lack of consistent rules for interaction amongst component parts lead to low resilience and unregulated growth. This growth, in turn, contributes more component parts that aren't formally integrated into the system, creating a downward spiral of instability. Loosely integrated cities are largely incapable of dealing with the challenges presented them today and there should be little expectation of their ability to meet the growing challenges of tomorrow.

Moderately integrated cities show some characteristics of highly and loosely integrated megacities. In these environments formal governments may be able

The preceding strategic appreciation provides a framework to begin understanding these environments. The following case studies illustrate the characteristics common to all megacities, as well highlight the interplay between dynamics of friction and capacity within these megacities which may compel U.S. intervention. The typology defined here provides a basic ordinal categorization to compare cities based on their degree of systemic integration. Viewed through this typology, New York is highly integrated. Bangkok, Rio de Janeiro, and Sao Paulo show moderate degrees of integration, while Lagos, Nigeria and Dhaka, Bangladesh appear far less integrated.

CASE STUDY: New York City, United States

Summary: Founded in 1624, New York City (NYC) is relatively young by global standards, yet it has undoubtedly become one of the most iconic and important cities in human history. As the home for the United Nations, it is the world's hub for international diplomacy and conflict resolution. The city is internationally renowned as a wellspring of modern American culture and home to some of the most recognizable structures in the world. [26]

Typology: NYC is the epitome of the **Highly Integrated** city. Its redundant systems, hierarchical structure, robust resources and connectedness make this one of the most resilient cities in the world. Military operations in environments like NYC would likely have a prescribed function, integrated into the cities already robust response framework. [26]

View of New York City Skyline from Brooklyn. °

Key Findings:

- Keeping NYC functioning is of **national and global importance**, and, in terms of capacity, the city sets the world standard for integration, antifragility and resilience. The city is densely instrumented and richly resourced. [26]

- As an **example of cities eclipsing states or nations in importance**, NYC's $1.13 trillion GDP ranks 13th in the world (comparable to Canada and ahead of South Korea and Australia). [27] NYC has its own foreign policy and its own State Department. [26]

- New York has a **mixture of different cultures** unmatched in the United States. With 600 separate cultural institutions, as well as over 51 million domestic and foreign tourists each year, agencies that provide services and security within the city must be able to understand and serve over 100 different nationalities often living in tightly knit Diaspora communities. [26]

- New Yorkers are **globally connected**. physically, socially, and technologically. The city enjoys a rich history of assimilation and integration, which contributes to its diverse demography, and is made possible by NYC's transportation infrastructure. NYC houses three international airports and a seaport which is the largest on the eastern seaboard and third largest in the nation. Virtual connectedness permeates the city and typifies the density of handheld communications and web enabled devices in highly integrated cities. This connectedness limits opportunities for tactical or operational surprise. [26]

- The city's heterogeneous population, while connected and integrated into the city, maintains unique sub-cultural identities with strong ties to various countries of origin. These ties are virtually supported through state of the art telecommunications and on-line social networks that enable monetary remittance flows to their families abroad. [26]

- The **robust flow systems** allow the population in Manhattan to fluctuate between 4 million people during the weekday to 1.6 million on weeknights. These same networks move 6 million people every day throughout the entire metropolitan region. [28]

- **The city exhibits anti-fragility.** When an attack or natural disaster occurs and a critical flow is disrupted, supporting infrastructure is not simply rebuilt; it is rebuilt stronger and able to withstand more. [29]

CASE STUDY: Bangkok, Thailand

Typical Canal in Bangkok, Thailand. �q

SUMMARY: Recent unrest in Bangkok has resulted from the struggle between a rural poor majority that has been underrepresented in Thailand's government, and an urban elite that has worked to maintain its power and influence.[30] The struggle between the so called "Reds and Yellows" does not appear to be diminishing and is likely to remain a feature of the political landscape in Thailand for the foreseeable future. It is not the kind of problem that the US Army can reasonably hope to influence or shape if it were called on to operate in Bangkok. It is simply a reality that would have to be dealt with.

Risk of natural disaster is also a major driver of instability. Bangkok sits on the Gulf of Thailand, an area that experts believe is at increasing risk as sea levels rise due to climate change.[31] Recent floods put an area the size of Kuwait under water after four feet of rain hit the country in a single week. Thus far, the country and city have been able to deal with natural disasters like this, but a more severe event, or series of events will surely strain the capacity of the nation to maintain order and security.

TYPOLOGY: Bangkok is a **Moderately Integrated** city. It exhibits many aspects of a highly integrated city, with a functioning government and security apparatus. But, Thailand underwent a coup, and it is beset by several significant drivers of instability. Infrastructure is generally good, and better than other Southeast Asian countries due to significant investment during the Vietnam era.[32] It is an intriguing case-study in what megacities of the future may look like, with both positive and negative features relevant to military planners.

KEY FINDINGS:

• Water flow in the canal systems alternately presents major risks and opportunities in Bangkok. Severe flooding is not uncommon. But a robust riverine capability would enhance any military operation.

• **Vehicle density** and associated traffic congestion on the roadways pose a significant challenge to maneuver in Bangkok, but a robust canal system is a significant opportunity.[33]

• **The Royal Thai Army (RTA) is an important contextual feature of Bangkok.** Such a highly equipped and capable force would likely reduce the requirement for direct foreign military assistance.[34]

• **Food distribution is the most fragile sustaining flow** in and around the city. Large stocks of food are rarely kept on hand and significant portions of the population eat out regularly.

Military relevance. Thailand is a valuable partner to the United States. In the future the U.S. Army's most likely mission in a place like Bangkok would likely be Humanitarian Assistance/Disaster Relief. But it is not unreasonable to expect that a counter-terrorism mission may arise at some point which would require Army assistance to host-nation forces. There are unique aspects to Bangkok that may require the Army to re-think how it goes about accomplishing these missions, particularly a canal system that could greatly enhance maneuver in the city, if the Army works to upgrade its riverine capabilities, and a strong host-nation Army that could facilitate Army efforts by reducing the need for large numbers of boots on the ground. Understanding and maintenance of key flows will also reduce the impact on local populations.

CASE STUDY: Rio de Janeiro, Brazil

r

SUMMARY: Rio is an aspiring world city, struggling to address the consequences of historical failure to integrate its vast slum communities (*favelas*) into the city's formal governance and support systems. Even as the city touts its economic achievements and hosting the 2014 World Cup and 2016 Summer Olympics, it is engaged in a violent struggle to gain control of its slums.

The over 600 *favelas* that dot the city now hamper its aspirations and may pose an existential threat due to the numerous militias and criminal gangs that now govern them.[35] They have the ability to paralyze the city through coordinated, city wide attacks, as occurred in November 2010 when over 3,000 police officers and military personnel were required to end city-wide violence emanating from a single *favela*. [36]

Typology: Rio de Janeiro is a **Moderately Integrated city,** possessing sufficient resilience to maintain the city's function despite the threat posed by criminal gangs and militias. It is capable of marshalling resources to address the challenge of the *favelas*, and receives robust support from a national government that oversees the eighth largest economy in the world.[37]

Key Findings:

* **The network of formal, informal and illicit security structures in Rio is complex.** Rio has four separate levels of po-

Rocinha *Favela*. ˢ

lice ranging from elite units to pacification police tasked to garrison favelas for 25 years.[38] Hundreds of local militias dot the city, competing with criminal gangs for control. All these groups have records of human rights abuses. To be successful, military action in megacities may require non-standard partnerships.

* **Increasing city integration is a long-term, expensive process.** Rio, Brazil's most famous and best resourced city, has launched a pacification program to make itself better integrated. Even with its significant resources, success is by no means certain. The implications for loosely integrated cities are profound: it seems unlikely that cities with extensive challenges and limited resources will reverse ongoing trends.

* **Alternately governed space in cities can pose unanticipated threats.** The 2010 city-wide attack shut down a global city and required heavy weapons, armored vehicles and aviation assets to quell. Fueled by lucrative illicit trade and entrenched in the local population, criminal gangs in Rio developed into a hybrid threat capable of challenging a national government. The reach of illicit and criminal networks operating from slums in megacities is limited only by their ambitions, and can be anticipated to take on global implications in the future.[39]

The U.S. Army has a great deal to learn from the challenges posed by the drug gangs of Rio de Janeiro. Utilization of combined arms maneuver against a hybrid threat in a megacity is a challenge Brazil is addressing now. Military-police partnership lies at the heart of the Brazilian approach, with extensive mapping and leveraging of local governance and security networks.

CASE STUDY: São Paulo, Brazil

SUMMARY: São Paulo is a city defined by rapid growth and separation. It is a dual-built environment, where the over 30,000 millionaires that inhabit the developed core and southwest suburbs of the city travel in armored cars or private helicopters over an impoverished periphery composed of over 1,600 informal communities (*favelas*) and 61,000 boarding houses (*cortiços*). [40] The proximity of extreme wealth and poverty in this city has generated instability, and rapid growth has outstripped the city's ability to manage. [41]

The city's function is threatened by illicit networks emanating from its slums. In May 2006, over 1,300 attacks were launched across the city by people loyal to the First Command of the Capital (PCC) drug gang. Simultaneously, riots occurred in 73 of the region's prisons. [41, 42] Coordinated attacks shut down the city, and forced the government to enter negotiations with the prison drug gang. More disturbing than its emergence is the fact that a nation possessing the world's eighth largest economy has been unable to uproot the gang despite building an enormous police force. [34]

TYPOLOGY: Like Rio, São Paulo is a **moderately-integrated** city. It exemplifies what future megacities could resemble: economically vibrant and vital while at the same time internally unstable.

Key Findings:

- **The confluence of alternately governed areas, illicit networks and cellular connectivity creates an environment where non-state actors can challenge city and national authority**. A prison drug gang, through use of cellular telecommunications, was able to manage illicit drug networks in São Paulo's prisons and in its *favelas* without government detection. Its 2006 coordinated attacks across the city and its prisons is an example of how non-state actors can pose a strategic threat. [43]

- Despite being in the same country, Rio and São Paulo are distinct from each other and may require different approaches. Though both cities face threats from criminal drug gangs, their histories and patterns of growth are distinct from each other. Rio, the historical capital of Brazil, is peppered with *favelas* that grew in undesirable areas and were eventually surrounded by urban development. São Paulo's century of meteoric growth resulted in a developed core and deliberately neglected periphery. **One "city system" cannot capture the complexity of each of these environments sufficiently.** [40]

While drivers of instability within cities (such as separation between rich and poor) do not at first appear to be strategic threats to US interests, the dramatic emergence of a criminal network empowered by cellular connectedness illustrates how non-state armed groups capable of threatening national interests or the homeland can emerge. The PCC, which formed in a single prison in 2001, was able to paralyze Brazil's largest city only five years later. [44] This example of a hostile actor disrupting a megacity is but one model of the potential for hostile groups to project power from within these environments, contest local governance, and foment instability.

Moinho *Favela*. [u]

v

SUMMARY: Lagos is one of the fastest growing cities in the world. Its population has exploded; from 270,000 in the 1950's, to 2.7 million in the 1960's to over 20 million today. By next year the population is expected to exceed 25 million.[45] The population surpassed the city's infrastructure capacity long ago and current urban planning efforts, while

Makoko Floating Village. [w]

ambitious and thoughtfully conceived, appear to have a low probability of effectively increasing security and stability in the foreseeable future. While terrorist organizations like Boko Haram have not yet infiltrated Lagos, it is a concern in the future.

Nigeria is a regional economic juggernaut and has the potential to be an incredibly important partner on the continent, both in terms of economic capacity and security cooperation.[46] The opportunities in Lagos are every bit as significant as the risks.

TYPOLOGY: Lagos is a **Loosely Integrated** megacity. Governance and security structures exist at the federal, state and local levels, however their ability to enforce regulations to alleviate pressure on infrastructure and resources is problematic.

KEY FINDINGS:

- **Massive population migration** is far beyond the government's ability to monitor or control and drives system demands far beyond the government's capacity. Authorities encourage vertical densification to mitigate horizontal sprawl and accommodate the mass immigration.**[45]**

- **The scale of Lagos is daunting**. Mainland Lagos (3,400 km^2, 25% larger than Rhode Island) is composed of continuous urban sprawl primarily made up of buildings and informal structures of 1-3 stories, the majority of which are connected by informal dirt roads and large swaths of slums and shanties that are alternately governed.

- The Makoko slums are one of the poorest areas not only in Nigeria, but in the world. Most of the slums float in the Lagos lagoon, and consist of shacks built to no construction standard. Yet, they have a school system, medical facilities, and even cell towers. **Alternatively governed spaces** will be more common in developing megacities in the future.[47]

Military relevance. The security of Nigeria is important for maintaining the fragile security of all of West Africa. Lagos, however, is not yet a major focus of military planners due to its ability to maintain relative security. If Lagos experienced a major natural disaster, or significant social unrest because of Lagos' glaring wealth disparity, it's unlikely that the extant security forces would be able to deal with the situation. This increases the likelihood that foreign assistance would be required, and, considering America's significant economic stake in Nigeria, some US military assistance might be offered. Lagos is also interesting as a future case study because of the significant presence of Chinese. Is it possible that in the future the US and China could partner militarily to aid Nigeria?

CASE STUDY: Dhaka, Bangladesh

Korail Basti. [y]

SUMMARY: As a rapidly growing state with poor governance and a high risk from natural disasters, Bangladesh is representative of many developing nations facing rapid urbanization challenges. Dhaka's strained flow systems (transportation, electrical, water, sewage, communications, etc.) and failing infrastructure will exacerbate the challenges this, the world's densest city, already present.

TYPOLOGY: Dhaka is a **Loosely-Integrated** city. As such it has significant instability drivers and insufficient resiliency capacity.

KEY FINDINGS:

- **Widespread corruption keeps Dhaka from developing resilience.** The city lacks the connectedness, redundancy, feedback loops, diversity, and ability to swarm and mass resources needed for resilience. Corruption at nearly every level interferes with every one of these characteristics.

- **Untracked, unregulated, and rapid growth** is driven by governance, geography and climate challenges unique to the region. It is estimated that over 20 million climate refugees to Dhaka will be generated by sea-level rise by 2030.[48]

- **Dhaka is the nation's cultural, economic and population center.** This leads the national government to focus closely on city operations, often at the expense of national concerns. It is widely acknowledged that as goes Dhaka, so too goes Bangladesh. [49]

- **Dhaka is a fragile city**, where there is real potential for a large-scale natural disaster that dwarf's the 2011 Haiti Earthquake. Lack of elected city government and widespread corruption have resulted in a capability vacuum between the neighborhood and national-level. Unregulated construction has resulted in a large proportion of the multistory buildings in the city being vulnerable to collapse. USAID and the Bangladesh Department of Disaster Management estimate that a minimum of 76,000 buildings will likely collapse during an earthquake of 7.0 or higher. [50]

The critical partner for the US Army in Dhaka is the Bangladesh Army. It is the most revered institution in the country, and one that regularly conducts crisis response in the city. The Army has divided the city into eight division-sized areas, and conducts regular liaison with local leadership. Moreover, military officers are embedded in key national and city agencies to ensure their functionality. [51]

The Army, as currently configured, will struggle to deploy to a megacity like Dhaka and sustain itself within it. Existing logistical and transport infrastructure does not support large-scale, container-based shipping. Ground movement within the city is highly restricted in many areas for military vehicles, complicating efforts to apply current methods for tactical maneuver or resupply. Over 15 million people already rely upon the overburdened transport infrastructure.

Conclusions

A megacity is not the only environment where a land force can be tasked to operate, but it is potentially the most challenging. Moreover, it is the locale where the Army's contribution to landpower is uniquely relevant. This work, which can be reviewed fully in the Chief of Staff of the Army Strategic Studies Group Cohort II Final Report, comprises a first effort to appreciate the strategic significance of this environment and its implication to the Army. It is the assertion of this group that megacities are unavoidable, the Army must lead the national response , and the institution is currently unprepared.

Megacities are Unavoidable. The accelerating migration of humanity to cities is undeniable. They are the centers of gravity for the human domain were drivers of instability converge. In a world made smaller by global connectedness, threats emanating from distant megacities will have the capability to threaten US interests, its allies and the homeland itself. If landpower is the tool to achieve strategic objectives in the human domain, then it will certainly be employed in this environment.

The Army must Lead. The Army is entrusted with the Title 10 responsibility to prepare forces for sustained operations on land.   It is the agent that must take responsibility for the Megacity challenge, build and empower a community of interest focused on these places, and formulate new strategic, operational and tactical approaches to large urban environments.

The Army is currently Unprepared. Although the Army has a long history of urban fighting, it has never dealt with an environment so complex and beyond the scope of its resources. A decade of war in Iraq and Afghanistan has taught the Army that it must shape itself to the complex environments in which it is called to operate. This is the process that must begin now with megacities.

As of now, megacities are blindspots from which a strategic surprise could emerge. It is plausible that the Army could be called to act in one of these places tomorrow. As their size and importance grows, it becomes probable. To succeed in each unique megacity, adaptability will not be enough. Now is the time for the Army to begin the process of understanding of these places and challenging itself across Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF). Building a force for the future requires imagination and a willingness to make bold choices. It is the institution's responsibility to prepare itself to provide the right tool to the Nation when contingencies arise.

A Way Forward

The National response to a threat emanating from a megacity will be joint and inter-agency. Congress, under Title 10, has tasked the Army to organize, train, and equip primarily for prompt and sustained operations on land. Consequently, the Army must take the lead in preparing our Nation to execute this probable, if not unavoidable mission.

As the Army assumes the lead to provide the Nation military options to achieve strategic objectives, the following questions, among others, deserve study:

- Is the current Regional Alignment of Forces construct effectively developing the regional expertise needed to achieve strategic objectives in a megacity?

- Is the megacity an environment where Landpower needs to be strategic? Can it serve as a relevant future challenge for the Strategic Landpower narrative?

- How might the Army institutionalize a community of interest focused on megacities that incorporates the intelligence community, academia and the operational force?

- What institutional paradigms need to change to prepare the Army to succeed in this emerging environment?

- What partners (Special Operating Forces, State Partnership for Peace, international partners, etc.) can the Army leverage to better understand the environment?

- How might the institution leverage Professional Military Education (PME) at all levels to study and educate itself on the science of cities and the complexities of the megacity environment?

- How does the Army build civil-military partnerships to facilitate training, testing and experimentation in large U.S. cities?

Our Army must take ownership of the megacity challenge. The Army knows the mandate; The Army knows the community involved; The Army knows this is an environment for which it is currently unready. Given the task, the Army must prepare now to ensure that when the time comes, the Nation has military options the Army has thought through and is prepared to execute.

z

How does the Army operate here? [aa]

How many Soldiers does this require? [bb]

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bb. **Strategic Studies Group,** 2014, *Dhaka, Bangladesh Skyline*.

cc. **Strategic Studies Group,** 2014, *Dhaka, Bangladesh city street*.

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ee. **Strategic Studies Group**, 2014, *New York City Skyline*.

City street in Dhaka, Bangladesh. cc
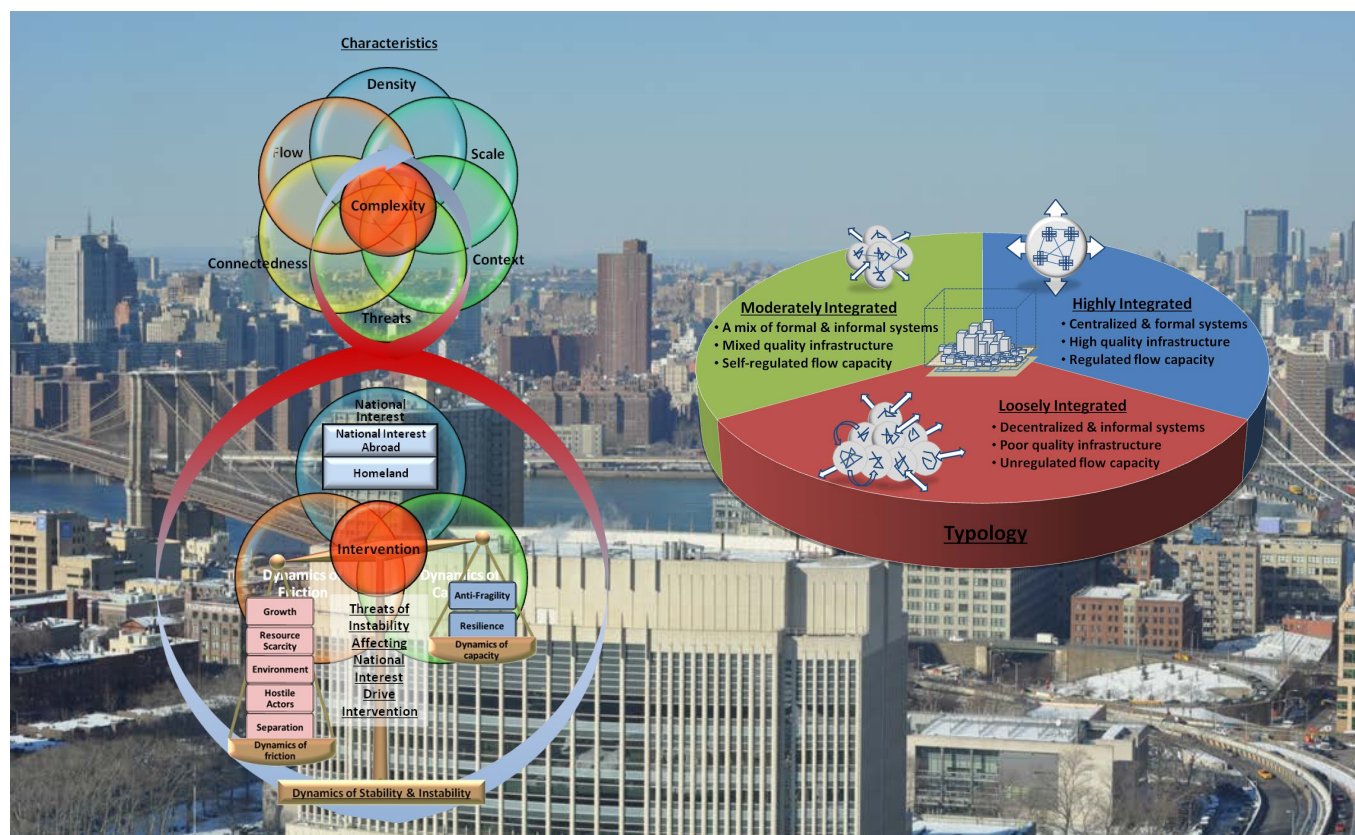

City street in Dhaka, Bangladesh. dd

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